We claim:

1. For use in the monitoring of the performance of refrigeration equipment or the like, apparatus for obtaining and recording data from selected sensors for sensing the values over time of selected operating parameters of the equipment, comprising in combination,

a plurality of sensors, each said sensor for continuously or continually sensing the value of a discrete said parameter;

at least one discrete signal reception unit connected to the sensors or to an associated unique one of said sensors for providing over time a series of digital parameter data representative of a series of sensed values of the parameter or parameters with which such sensor is associated;

a computer operating under the control of a program for coordinating and organizing the digital parameter data and operating on the data to identify existing or incipient fault conditions and providing an output dependent upon the parameter data and the operations thereon;

one or more receivers for receiving at least a selected portion of the computer output;

communications links at least one from each said signal collection unit to the computer and at least one from the computer to each said receiver for transmitting data therebetween.

2. Apparatus as defined in Claim 1, wherein the computer and at least one said receiver are integrated into a single unit.

3. Apparatus as defined in Claim 1, wherein, in operation, the receiver provides a display of selected data received from the computer and provides an alarm in the event of a detected fault condition.

4. Apparatus as defined in Claim 1, wherein the receiver is remotely located relative to the equipment, thereby permitting remote monitoring of existing or incipient fault conditions in the equipment.

5. Apparatus as defined in Claim 1, comprising a microcontroller coupled to or forming part of the or each said signal collection unit, the microcontroller in operation being programmed to

control and coordinate the operation of the or an associated one of said signal collection units and an associated one of said communications links.

6. Apparatus as defined in Claim 5, wherein the microcontroller is programmed to organize the digital parameter data as time series.

7. Apparatus as defined in Claim 1, wherein the computer is programmed to organize the digital parameter data as time series.

8. Apparatus as defined in Claim 5, wherein the microcontroller converts to digital form any sensed data in analog form.

9. Apparatus as defined in Claim 1, wherein the receiver is part of a monitoring and recording unit and is operable to provide a record of selected current and/or historic parameter data and/or data representing an existing or incipient fault condition in the monitored equipment.

10. Apparatus as defined in Claim 1, wherein the computer is part of or connected to a monitoring and recording unit for monitoring and/or recording existing or incipient fault conditions in the monitored equipment and related parameter data, and wherein the receiver is remotely connected to the monitoring and recording unit and is operable to provide a record of selected current and/or historic parameter data and/or data representing an existing or incipient fault condition in the monitored equipment.

11. Apparatus as defined in Claim 1, including a database associated with and accessible by the computer for storing parameter data and reference data.

12. Apparatus as defined in Claim 7, wherein the computer is programmed to operate on the time series of digital parameter data received from the signal collection unit or units, the computer in operation

a) storing (i) immediately preceding historic data for one or more predetermined time intervals, and (ii) reference data with which to compare such historic data;

b) comparing current data and/or historic data with the reference data so as to detect an incipient or existing fault condition; and

c) transmitting to the receiver the warning or alert signal or message whenever such incipient or existing fault condition is detected, together with data identifying the incipient or existing fault condition.

13. Apparatus as defined in Claim 12, wherein the computer in the performance of step (b) executes a set of selected performance checks on the digital sensor data in order to detect and identify fault conditions, and wherein the computer in the performance of step (c) causes data representing at least the location of the equipment, the nature of the fault and the date and time the fault was detected to be transmitted to the receiver, and wherein the receiver comprises a pager or monitor accessible by service personnel.

14. Apparatus for monitoring refrigeration equipment or the like powered by electricity supplied by a suitable source, said refrigeration equipment or the like comprising an electrically powered compressor, an evaporator, and a refrigeration chamber;
said monitoring apparatus in operation periodically sensing the values of a selected group of operating parameters of the equipment, providing output data representative of the sensed values, and performing a series of equipment performance checks or tests on the output data thereby to identify existing or incipient problems with the equipment;
characterized in that the monitoring apparatus is provided with sensors and sensed parameter data value inputs obtained from the sensors associated with the selected group of operating parameters, and that the said selected operating parameters include at least the following parameters:

(a) the line voltage of the source of electricity;
(b) the current drawn by the compressor;
(c) the condenser pressure;
(d) the refrigeration chamber temperature; and
(e) the evaporator pressure.

15. Apparatus as defined in Claim 14, wherein the refrigeration equipment or the like further includes an electrically powered defroster, and further characterized in that the selected group of operating parameters also comprises the defroster current.

16. Apparatus as defined in Claim 14, wherein the monitoring apparatus includes in combination,

a sensor for continuously or continually sensing the value of each said parameter;
a discrete signal collection unit connected to each said sensor for providing over time a stream of digital output data representative of a series of sensed values of the parameter with which such sensor is associated;
a general-purpose computer for coordinating the operation of the sensors and signal collection units; and
a communications link from each said signal collection unit to the computer for transmitting the data streams to the computer under the control of the computer;
and wherein the computer causes and controls the performance of the equipment performance checks or tests.

17. Apparatus as defined in Claim 14, further characterized in that the equipment performance checks include at least some performance checks selected to enable by means of comparisons with suitable selected threshold values of associated monitored parameters the provision of alerts or warnings of at least some of the following possible existing or incipient faults in or associated with the monitored equipment:

(a) Power outage
(b) Power restored
(c) High line voltage
(d) Low line voltage
(e) Locked compressor rotor high amperage
(f) Long compressor on-cycle
(g) Short compressor on-cycle
(h) Long compressor off-cycle
(i) No-refrigerant-pressure alert (there is zero or extremely low refrigerant pressure on the intake side of the compressor)
(j) Cut-out-pressure-too-low warning (the pressure on the intake side of the compressor is too low while the compressor continues to pump)
(k) Cut-in-pressure-too-high warning (the pressure on the intake side of the compressor is too high while the compressor has not yet begun to pump)
(l) High-pressure warning (the compressor is pumping and the pressure on the condenser side of the compressor is too high).

18. Apparatus as defined in Claim 14, further characterized in that the monitoring apparatus in operation provides alerts or warnings for selected ones of the existing or incipient faults as (i) a high-alert signal if, for each such selected fault, the associated monitored parameter or parameters are of values that exceeds or falls below, as the case may be, a predetermined critical threshold as measured at a predetermined time or over a predetermined time interval thereby indicating that the fault condition is critical, and (ii) a low-warning signal if an existing or incipient fault condition is detected but the associated monitored parameter or parameters are of values that fail to cross the predetermined critical threshold.

19. Apparatus as defined in Claim 18, wherein the refrigeration equipment or the like further includes an electrically powered defroster, and further characterized in that the selected group of operating parameters also comprises the defroster current, and that the selected performance checks include checks of the defroster current to reveal an existing or incipient fault condition that the defroster current is too high or too low, as compared with predetermined defroster current high and low threshold values.

20. Apparatus for monitoring refrigeration equipment or the like powered by electricity supplied by a suitable source, said equipment having an electrically powered compressor, an evaporator, and a refrigeration chamber, said monitoring apparatus comprising means for periodically sensing the values of a selected group of operating parameters of the equipment and for providing output data representative of the sensed values, and for performing a series of equipment performance checks or tests on the output data thereby to identify existing or incipient problems with the equipment;
characterized in that
(i) the monitoring apparatus in reference value mode first establishes reference values of the selected operating parameters by sensing and storing values of the selected operating parameters during satisfactory normal operation of the equipment; and that
(ii) the monitoring apparatus in continuing operation performs equipment performance checks or tests that include a comparison of present values and/or immediately preceding historic values of the selected operating parameters with corresponding reference values for the selected operating parameters.

21. Apparatus as defined in Claim 20, further characterized in that the monitoring apparatus senses, performs performance checks or tests on, and establishes reference values for, at least the following parameters:

(a) the line voltage of the source of electricity;

(b) the current drawn by the compressor;

(c) the condenser pressure;

(d) the refrigeration chamber temperature; and

(e) the evaporator pressure.

22. Apparatus for monitoring refrigeration equipment or the like powered by electricity supplied by a suitable source, said refrigeration equipment or the like comprising an electrically powered compressor, an evaporator, and a refrigeration chamber; the monitoring apparatus comprising in combination,

a sensor for continuously or continually sensing the value of each said parameter;

a discrete signal collection unit connected to each said sensor for providing over time a stream of digital parameter data representative of a series of sensed values of the parameter with which such sensor is associated;

a general-purpose computer for coordinating the operation of the sensors and signal collection units and performing a series of performance checks on the equipment using the digital parameter data thereby to identify existing or incipient fault conditions in the equipment;

data storage means for storing selected data;

a communications link from each said signal collection unit to the computer for transmitting the data streams to the computer under the control of the computer; and

a display monitor connected to and receiving output from the computer for viewing selected data and selected performance check results;

characterized in that

the data storage means includes reference data providing a standard of comparison against which sensed data may be compared;

the computer compares the data stream or selected data extracted or calculated therefrom with the reference data or selected portions of the reference data when performing the performance checks; and

the computer output to the display monitor and displayed on the display monitor

includes the results of selected performance checks.

23. Apparatus as defined in Claim 22, wherein the display monitor is remote from the computer and is connected thereto by a telecommunications link.

24. Apparatus as defined in Claim 23, wherein the display monitor is or is incorporated into a pager.

25. Apparatus as defined in Claim 24, wherein selected reference data is in the form of threshold values for selected parameters against which the computer compares current values of associated parameters in the course of performing selected ones of the performance checks.